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ABSTRACT

A Canadian study designed to develop a reading readiness battery which would include proven types of prereading measures and newly conceived predictors is discussed. The goals of the study were to identify and develop indexes of reading readiness for the child's concept of the reading task, his perceptual ability, his linguistic competence and his level of cognitive functioning, to determine the factorial nature of the domain of reading readiness, and to determine the best combination of tests to predict reading achievement. Thirteen tests of specific skills and abilities were grouped into one battery and administered to 97 elementary school students from various school districts. Test results were correlated and factor analyzed. It was found that one general readiness factor accounted for nearly one-half the total variance of the tests. Three additional factors were identified: listening, conceptualizing, and literacy behavior. It was concluded that to serve a diagnostic function, a readiness test must have a range of subtests. Tables and bibliography are included. (AL)

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THE NEW CANADIAN READING READINESS TEST RESEARCH

Reading Readiness

Introduction

This study was an attempt to develop a reading readiness battery which would include proven types of prereading measures as well as newly conceived predictors. An examination of past research provided some guidelines for selecting proven measures. Many investigations have been concerned with the perceptual prereading tasks. Not surprisingly the perceptual measures, which have high correlations with end-of-first grade reading achievement, tend to more closely resemble the actual

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reading task. A number of researchers (1, 10) have reported a task involving discrimination and knowledge of letters as the best single predictor of reading achievement of all visual discrimination measures studied. Visual discrimination of words to a lesser extent has been found to be a better predictor (1, 6, 8). Prereading tasks involving auditory discrimination of beginning sounds in word tasks have been shown to predict better than others of this type (3).

A number of studies on predictive measures have reported a large proportion of the variance in reading achievement unaccounted for. Buktenica (2) investigating relationships between visual and auditory perception reported that they only accounted for 37% of the variance in paragraph reading at the end of first grade. It would appear, as several researchers have suggested, that other types of reading readiness measures need to be investigated (1, 3, 9).

Specifically, relatively little attention has been given to the non-perceptual components which constitute part of the total complex of reading readiness skills. Technical linguistic terms such as "word," "letter," "number," "sound" etc. are often used by teachers when talking to their first grade students. Similarly, teachers assume that children possess the ability to conceptualize and label real and vicarious experiences, i.e., that they possess the ability to associate meaning with verbal symbols. Also assumed is the child's syntactic and morphological competence sufficient to enable him to form and comprehend grammatical structures in language. Further, the child's cognitive functioning is infrequently measured as an indicator of his ability to cope with the memory requirements of beginning reading. Also, the rate at which the

child can assimilate the visual linguistic stimuli is seldom considered in predicting reading success. Determining the significance of these components in reading readiness and identifying the degree to which each contributes to a child's reading success, were two important aspects of this study.

A review of the reading readiness test literature shows that although many studies employ various predictive techniques, few have investigated the interrelationships of new predictive techniques with respect to their efficacy to predict in combination. Through the use of factor analysis and multiple linear regression techniques, it should be feasible to define relatively independent factors with minimum degrees of interrelationships, yet significantly related to reading success. The present investigation was based on the information obtained from the aforementioned findings and reflections.

Purposes of the Study

In general, the purpose of this study was to develop a battery of measures to index the level of reading readiness of school beginners and to determine the best combination of these tests to predict reading achievement at the end of first grade. The specific aims were:

1) To identify and develop indices of reading readiness for the child's concept of the reading task, his perceptual ability, his linguistic competence, and level of cognitive functioning;
2) To determine the factorial nature of the domain of reading readiness;
3) To determine the best combination of tests to predict reading achievement.

METHOD

Subjects

The subjects studied in this investigation were 97 children from five first grade classrooms randomly selected from ten schools located in five different school districts on Vancouver Island, British Columbia. The selection of the schools was made by the elementary school supervisors of the different school districts. These schools were located in predominantly middle class neighborhoods. Initially there were 135 subjects, however, children with severe visual or auditory difficulties were excluded as were those who moved away from the school districts.

Measuring Instruments and Procedure

Thirteen measures of prereading ability were developed and grouped together into one battery tentatively titled The Canadian Reading Readiness Test.

These measures were concerned with the following four areas of reading readiness:

i. the child's concept of the reading task
ii. the child's perceptual ability
iii. the child's linguistic competence
iv. the child's level of cognitive functioning

The Thirteen group tests are listed below together with a short explanation of the new tests in this battery for purposes of clarification.

1) Orientation to Literacy: A subtest designed to discover the extent to which the child understands the communication purpose of literacy.

2) Understanding Literacy Behavior: A subtest designed to find out if a child can recognize reading and writing activities.
3) Technical Language of Literacy: A measure which samples a child's knowledge of technical terms such as "letter," "word," "number," etc.
4) Visual Letter Recognition
5) Visual Word Matching
6) Initial Phonemes
7) Final Phonemes
8) Semantics: This subtest is designed to measure a child's ability to categorize.
9) Syntax: A subtest designed to measure a child's ability to discriminate between grammatical and non-grammatical utterances read by the examiner.
10) Morphology: A measure developed to discover whether the child understands morphological changes in words.
11) Visual Memory: A task testing a child's retention, for a short period, of the configuration of a printed word.
12) Learning Rate: A subtest designed to measure capacity to learn sight words.

Procedure

The data were collected in two parts. During the middle of September the experimental readiness tests were administered by each classroom teacher. As the criterion measure, the Bond-Balow-Hoyt Reading Achievement Test Form L-II was given to the same children during the last week of May.

Analysis and Results

Reliability. To determine the internal consistency of each subtest the Kuder Richardson (1937) reliability coefficient was computed with the results shown in Table 1.

INSERT TABLE 1 ABOUT HERE

The reliability coefficient values for the 13 subtests ranged from .518 to .946.

Relationships Between the Readiness Measures

Intercorrelations between the subtests by the product moment method were computed as shown in Table 2. Almost one half of the possible combinations were statistically significant at the 0.1 level according to Ferguson (4). However, only four were substantial (5). The subtests appeared to be relatively independent, however the correlation of .51 between the subtest Technical Language of Literacy and the Visual Letter Recognition suggested underlying relationships.

INSERT TABLE 2 ABOUT HERE

Factor Analysis. One purpose of this study was to investigate the factorial nature of the domain of reading readiness as represented by measures included in the experimental test battery. The data were analyzed to determine the factor structure of prereading abilities and to compare the factors inherent in the test battery with the theoretical constructs on which they were developed. As well, the identity of the most potent variables was sought. The correlation matrix was analyzed

by the principle axes method to obtain the initial solution. The Kaiser criteria were used to determine the number of factors retained for rotation. Therefore, all factors with eigenvalues greater than one were analyzed. For this problem four factors were extracted with eigenvalues greater than one, accounting for 64.195% of the total variance. For interpretive purposes the four factors were rotated by the varimax criterion to achieve simple structure. Table 3 shows the varimax solution for this problem.

INSERT TABLE 3 ABOUT HERE

The subtest loading on each of the four factors extracted are shown in Table 4 together with their factors loading on the simple axes.

INSERT TABLE 4 ABOUT HERE

Loadings of .324 or above were considered significant. Factor I identifies a general reading readiness factor and accounted for 28.4 percent of the total variance. The variables, falling on all of the four general areas being indexed, reveal a wide ranging readiness skill comprised of the child's orientation to reading, certain perceptual skills, a language competence, and an appropriate level of cognitive functioning. The second factor accounted for 15.4 percent of the total variance seemed to be related to the area of listening. Factor III with 10.5 percent of the total variance appears to be a conceptualizing factor. The high loading variables on the factor, Orientation to Literacy, Technical Language of Literacy, and Semantics require the individual to identify certain concepts relating to reading that pertain to the nature

of reading. The final factor, titled Literacy Behavior, accounted for 9.8 percent of the variance and loads the variables: Understanding Literacy Behavior, Technical Language of Literacy, and Listening Comprehension.

Multiple Regression Analysis. The predictive power of the readiness subtests was determined through the use of a regression equation employing the Bond-Balow-Hoyt as criterion measures. A stepwise procedure of analysis was used in which the predictor variables entered the regression equation in order of their greatest contribution to the increase in R^2. Each entering variable was tested for significance, and optimum predictive efficiency was considered present when no additional variable entered at a significance level of .05. The results of this analysis are shown in Table 5.

INSERT TABLE 5 ABOUT HERE

On the first criterion measure, Word Recognition, the Visual Letter Recognition subtest was the best predictor followed by Learning Rate, Listening, and Semantics. For the second subtest, Comprehension of Ideas, the Visual Letter Recognition subtest was the best predictor followed by Semantics and Morphology. On the Comprehension of Instructions criterion measure, the best predictor was again the Letter Recognition subtest followed by Visual Word Matching, Syntax, Orientation to Literacy, and Final Phonemes subtest. Only the subtests: Understanding Literacy Behavior, Technical Language of Literacy, and Visual Memory did not appear as significant contributors to the regression equations.

The child's perceptual ability as measured by the Letter Recognition subtest appears to be the best single predictor on all the subtests on the Bond-Balow-Hoyt reading test. Other measures of perceptual ability contributing to prediction of reading achievement were Word Matching and Ending Sounds.

Children's cognitive functioning, as indexed by the Learning Rate and Listening subtests, was a powerful predictor of word recognition ability. These subtests did not appear as significant contributors to other measures of reading achievement.

The tests of linguistic competence were significant predictors of reading achievement as measured by each of the subtests of the criterion measure. This finding is highly indicative of the fundamental role of linguistic competence in the development of reading.

Within the areas of the child's concept of the reading task the subtest, Orientation to Literacy, was a significant predictor of the child's ability to comprehend instructions.

Discussion

This investigation has provided some answers to the three problems posed originally and revealed some insights into several aspects of reading readiness. In the factor analysis there was an unexpected result, the emergence in the first factor of a large and powerful general factor regardless of the type of rotation to simple structure that was used. One might have expected to see several generally equal factors of readiness to be revealed, perhaps corresponding to the four general areas of readiness being indexed by the thirteen subtests. However, almost one-

half of the total variance of the tests was accounted for by the first factor indicating its importance in the psychological behavior of children. Furthermore, subtests from each of the four areas of readiness which were postulated by the researchers had substantial loadings on this general factor. This evidence indicates that this general readiness factor needs to be developed in the child before any individual competencies related to reading behavior can have much effect upon performance.

Three additional factors were identified, Listening, Conceptualizing, and Literacy Behavior. These factors revealed the importance of the child's linguistic and symbolic readiness as well as his awareness of the nature of literacy behavior. Also evident was the breadth of reading readiness in that it included not only perceptual readiness but linguistic and sociological readiness as well. Readiness tests, therefore, must be comprised of a wide range of subtests to index this wide range of readiness variables.

The regression analysis revealed that subtests from each of the four areas postulated to comprise reading readiness and the four readiness factors identified through factor analysis procedures contributed significantly to the effectiveness of prediction of the total test. The child's perceptual ability appeared to be the best predictor of reading achievement. This was followed closely by his cognitive functioning ability, his linguistic ability, and his concept of the reading task.

One interesting finding of the study was the significant contribution of the experimental subtest Orientation to Literacy in predicting the reading achievement on the sub-test Comprehension of Instructions. Many of the children tested did not have clear concepts of what a "word," or a

"letter," or a "number" was. Considering how often these terms are used in the classroom, perhaps time should be spent helping children understand what they mean.

The different kinds of reading behavior as indexed by the criterion measures required a different "mix" of readiness abilities. Word recognition behaviors in reading were dependent upon the reader's readiness in: Letter Recognition, Learning Rate, Listening, and Semantics. Comprehension of ideas depended upon readiness in: Letter Recognition, Semantics and Morphology. Comprehension of instructions depended upon readiness in: Letter Recognition, Word Matching, Syntax, Orientation to Literacy, and Ending Sounds. Therefore, to serve a diagnostic function, a readiness test must have a range of subtests. The proposed new test of reading readiness will thus be comprised of the most effective predictors of reading achievement from the original set and will range across the four general areas postulated to comprise readiness and the four factors of reading readiness found to be present in children. The subtests to be retained are: Orientation to Literacy, Technical Language of Literacy, Letter Recognition, Word Matching, Beginning Sounds, Semantics, Syntax, and Learning Rate. It is postulated that this battery of tests will effectively serve the dual function of prediction of reading achievement and the diagnosis of readiness deficiencies in primary children.

TABLE 1

Kuder Richardson reliability coefficients

for the experimental subtests

Variable		KR-20 Coefficient
X_1	Orientation to Literacy	.712
X_2	Understanding Literacy Behavior	.592
X_3	Technical Language of Literacy	.834
X_4	Letter Recognition	.946
X_5	Word Matching	.779
X_6	Beginning Sounds	.775
X_7	Ending Sounds	.676
X_8	Semantics	.840
X_9	Syntax	.504
X_{10}	Morphology	.522
X_{11}	Visual Memory	.679
X_{12}	Learning Rate	.858
X_{12}	Listening	.518

TABLE 2

Inter-correlation between experimental measures

	1	2	3	4	5	6	7	8	9	10	11	12	13
1													
2	0.090												
3	0.100	0.140											
4	0.032	0.033	0.514										
5	-0.109	0.177	0.251	0.466									
6	-0.016	0.036	0.270	0.548	0.491								
7	-0.139	-0.002	0.289	0.481	0.382	0.625							
8	0.219	-0.044	0.339	0.391	0.210	0.351	0.293						
9	-0.037	0.237	0.260	0.400	0.210	0.387	0.325	0.415					
10	0.026	0.103	0.191	0.245	0.310	0.420	0.422	0.253	0.355				
11	-0.079	0.025	0.123	0.257	0.458	0.419	0.433	0.174	0.271	0.489			
12	0.029	-0.132	0.281	0.616	0.458	0.495	0.453	0.447	0.355	0.393	0.359		
13	0.065	0.234	0.225	0.189	0.155	0.072	0.115	0.177	0.245	0.479	0.289	0.206	

TABLE 3

Factor analysis of the 13 experimental subtests using the varimax rotation

COMMUNALITIES					
1	0.599	-0.107	0.028	0.765	0.028
2	0.823	-0.022	0.110	-0.054	0.904
3	0.559	0.552	-0.070	0.333	0.372
4	0.730	0.829	0.008	0.169	0.155
5	0.558	0.629	0.263	-0.275	0.178
6	0.651	0.767	0.231	-0.091	-0.044
7	0.612	0.703	0.278	-0.182	-0.084
8	0.663	0.516	0.141	0.582	-0.089
9	0.435	0.480	0.281	0.166	0.313
10	0.739	0.279	0.811	0.063	0.020
11	0.649	0.368	0.673	-0.229	-0.086
12	0.663	0.710	0.274	0.183	-0.226
13	0.684	-0.008	0.718	0.252	0.324
PERCENT OF TOTAL VARIANCE					
	64.195	28.433	15.413	10.504	9.845

TABLE 4

The nature of reading readiness abilities

orthogonal factor structure--varimax rotation

Factor I		Factor III	
General Readiness		Conceptualizing	
Loading	Variable	Loading	Variable
.552	Technical Language of Literacy	.765	Orientation to Literacy
.829	Letter recognition	.333	Technical Language of Literacy
.629	Word matching	.582	Semantics
.767	Beginning sounds	Percent of Variance	10.504
.703	Ending sounds		
.516	Semantics		
.480	Syntax		
.368	Visual memory		
.710	Learning rate		
Percent of Variance	28.433		

Factor II		Factor IV	
Listening		Literacy Behavior	
Loading	Variable	Loading	Variable
.811	Morphology	.904	Understanding Literacy Behavior
.673	Visual memory	.372	Technical Language
.718	Listening	.324	Listening
Percent of Variance	15.413	Percent of Variance	9.845

TABLE 5

Stepwise regression analysis for readiness subtests

as predictors of Bond Balow Hoyt achievement test

Bond Balow Hoyt Subtest	Step Number	Readiness Subtest	R^2	Probability Level	Standard Error
Word Recognition	1	Visual Letter Recognition	50.96	.00000	5.03
	2	Learning Rate	62.35	.00000	4.43
	3	Listening	64.57	.01	4.32
	4	Semantics	65.93	.05	4.26
Comprehension of Ideas	1	Visual Letter Recognition	43.22	.00000	8.52
	2	Semantics	46.23	.02	8.34
	3	Morphology	51.46	.01	8.01
Comprehension of Instructions	1	Visual Letter Recognition	43.22	.00000	4.04
	2	Visual Word Matching	48.16	.003	3.88
	3	Syntax	51.00	.02	3.79
	4	Orientation to Literacy	53.57	.02	3.71
	5	Final Phonemes	55.39	.05	3.66

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